

## Claims

1. A method for producing a metal wire for reinforcing an elastomeric material, the metal wire comprising a metal core and a metal coating layer, said core having a predetermined initial diameter, the method comprising the steps of:
  - 5 a) submitting said metal core to at least one surface treatment for predisposing the surface of the core to being coated with said coating layer;
  - b) thermally treating said core;
  - c) depositing said metal coating layer to a predetermined initial thickness on said core by means of a plasma deposition technique; and
  - 10 d) drawing the coated core until the core has a final diameter smaller than said predetermined initial diameter and the metal coating layer has a final thickness smaller than said predetermined initial thickness.
2. The method according to claim 1, wherein said surface treatment, thermal treatment, deposition and drawing steps are carried out in a substantially continuous manner.
- 15 3. The method according to claim 2, wherein said core is conveyed through a sequence of respective surface treatment, thermal treatment, deposition and drawing positions at a speed comprised in the range from about 10 to about 80 m/min.
4. The method according to claim 1, wherein the surface treatment step comprises the step of pickling said core into a pickling bath and washing the pickled core into water.
- 20 5. The method according to claim 4, further comprising the step of drying the washed core.
6. The method according to claims 5, wherein said drying step is carried out by means of a least one blower.
7. The method according to claim 1, further comprising the step of dry drawing said  
25 core before said thermal treatment.
8. The method according to claim 1, wherein said plasma deposition technique is selected from the group comprising: sputtering, evaporation by voltaic arc, plasma spray and plasma enhanced chemical vapor deposition (PECVD).

9. Method according to claim 1 or 8, wherein said step of depositing the metal coating layer on said core is carried out in at least one vacuum deposition chamber at a first predetermined pressure.
- 5 10. The method according to claim 9, wherein the step of depositing the metal coating layer on said core is carried out a plurality of times.
11. The method according to claim 9, wherein said first predetermined pressure is comprised in the range from about  $10^{-3}$  to about  $10^{-1}$  mbar.
- 10 12. The method according to claim 9, further comprising the step of conveying said core in at least one pre-chamber at a second predetermined pressure higher than said first predetermined pressure, said pre-chamber being arranged upstream of said at least one vacuum deposition chamber.
13. The method according to claim 12, wherein said second predetermined pressure is comprised between about 0.2 mbar to about 10 mbar.
- 15 14. The method according to claim 1, further comprising the preliminary steps of descaling a wire rod and of dry drawing said rod so as to obtain said core having a predetermined initial diameter.
15. The method according to claim 1, wherein the coating layer is made of a metal material different from the metal material of the core.
16. The method according to claim 1, wherein said core is made of steel.
- 20 17. The method according to claim 1, wherein said coating metal is selected from the group comprising: copper, zinc, manganese, cobalt, tin, molybdenum, iron and alloys thereof.
18. The method according to claim 17, wherein said coating metal is brass.
- 25 19. The method according to claim 18, wherein the brass has a copper content of from about 60 to about 72% by weight.
20. The method according to claim 15, wherein said coating metal further comprises a predetermined amount of a lubricating agent.
21. The method according to claim 1, wherein said initial thickness of the metal coating

layer is at least about 0.5  $\mu\text{m}$ .

22. The method according to claim 21, wherein said initial thickness of the metal coating layer is comprised between about 0.5 and about 2  $\mu\text{m}$ .

5 23. The method according to claim 1, wherein said drawing step causes the final diameter of the core to be reduced of about 75-95% with respect to the initial diameter of the core.

24. The method according to claim 23, wherein the final diameter of the core is comprised in the range from 0.10 to 0.50 mm.

10 25. The method according to claim 1 or 23, wherein said drawing step causes the final thickness of the coating layer to be reduced of about 75-95% with respect to the initial thickness of the coating layer.

26. The method according to claim 25, wherein the final diameter of the metal coating layer is comprised in the range from 80 to 350 nm.

15 27. The method according to claim 1, wherein said initial diameter of the core is comprised between about 0.85 and about 3 mm.

28. The method according to claim 1 or 25, wherein said initial thickness of the coating layer is comprised between about 0.5 and about 2  $\mu\text{m}$ .

20 29. A metal wire for reinforcing an elastomeric material, said metal wire comprising a metal core and a metal coating layer, said metal wire being obtained by the method according to any one of claims 1 to 28.

30. A method for producing a metal cord for reinforcing an elastomeric material, said method comprising the step of producing a plurality of wires according to any of claims 1 to 28 and the step of stranding said plurality of wires.

25 31. A metal cord for reinforcing an elastomeric material, comprising a plurality of wires according to claim 30.